CLAIMS

What is claimed is:

1. A conductive structure for connecting a contact pad of a semiconductor device and a contact pad of a substrate, comprising:

a female member configured to be secured to the contact pad of one of the semiconductor device and the substrate, said female member having:

a jacket with an aperture configured to be located over the contact pad; and

a conductive center partially filling said aperture with an upper portion of said aperture being open; and

a male member configured to be secured to the corresponding contact pad of the other of the substrate and the semiconductor device, said male member having:

a jacket having an end configured complementarily to said upper end of said aperture of said jacket of said female member, said jacket having an aperture configured to be located over the corresponding contact pad; and

a conductive center substantially filling said aperture.

2. The conductive structure of claim 1, wherein said aperture of said jacket of said female member is configured to partially limit insertion of said male member thereinto.

3. The conductive structure of claim 2, wherein said aperture comprises an inner ledge configured to prevent further insertion of said male member thereinto.

4. The conductive structure of claim 2, wherein said aperture tapers inwardly.

5. The conductive structure of claim 1, wherein an outer surface of said jacket of said male member is configured to partially limit insertion of said male member into said aperture of said jacket of said female member.

6. The conductive structure of claim 5, wherein said outer surface is tapered.

7. The conductive structure of claim 6, wherein said outer surface has a frustoconical configuration.

8. The conductive structure of claim 5, wherein said jacket of said male member has an end portion with a smaller periphery than a base portion of said jacket.

9. The conductive structure of claim 8, wherein said outer surface comprises an outer ledge between said end portion and said base portion of said jacket.

10. The conductive structure of claim 1, wherein at least one of said jackets comprises a photopolymer.

11. The conductive structure of claim 10, wherein said at least one of said jackets comprises a plurality of superimposed, contiguous, mutually adhered layers of said photopolymer.

12. The conductive structure of claim 1, wherein said aperture of said jacket of said female member is configured to facilitate alignment of said male member and said female member.

13. The conductive structure of claim 12, wherein said aperture tapers inwardly.

14. The conductive structure of claim 1, wherein an outer surface of said jacket of said male member is configured to facilitate alignment of said male member and said female member.

15. The conductive structure of claim 14, wherein said outer surface tapers outward from said end to a base portion thereof.

16. The conductive structure of claim 15, wherein said outer surface has a frustoconical configuration.

17. The conductive structure of claim 1, wherein at least one of said conductive centers comprises at least partially unconsolidated conductive material.

18. The conductive structure of claim 1, wherein said at least partially unconsolidated conductive material is at least partially uncured conductive resin.

19. The conductive structure of claim 18, wherein said at least partially uncured conductive resin is uncured conductive resin.

20. The conductive structure of claim 1, wherein at least one of said conductive centers comprises a thermoplastic conductive elastomer.

21. The conductive structure of claim 1, wherein at least one of said conductive centers comprises a solder, a metal, or a metal alloy.

22. A semiconductor device component, comprising:

a substrate having at least one contact pad exposed at a surface thereof;

a first member of a conductive structure secured to said at least one contact pad, said first member including a jacket having an aperture through the length thereof and a conductive center in said aperture, said first member being configured complementarily to a second member of said conductive structure secured to a corresponding contact pad of another substrate of another semiconductor device component.

23. The semiconductor device component of claim 22, wherein said substrate comprises a flip-chip type semiconductor device.

24. The semiconductor device component of claim 23, wherein said flip-chip type semiconductor device comprises a flip chip die.

25. The semiconductor device component of claim 23, wherein said flip-chip type semiconductor device comprises a ball grid array package.

26. The semiconductor device component of claim 22, wherein said substrate comprises a chip scale package.

27. The semiconductor device component of claim 22, wherein said substrate comprises a carrier substrate.

28. The semiconductor device component of claim 22, wherein said jacket and said aperture are configured to contain said conductive center over said at least one contact pad.

29. The semiconductor device component of claim 22, wherein said conductive center substantially fills said aperture.

30. The semiconductor device component of claim 29, wherein said first member is configured to be received by an aperture formed in said second member.

31. The semiconductor device component of claim 29, wherein an outer surface of said jacket has a smaller periphery at an end thereof than at a base portion thereof.

32. The semiconductor device component of claim 31, wherein said outer surface includes an outer ledge located between said end and said base portion.

33. The semiconductor device component of claim 31, wherein said outer surface tapers outwardly from said end to said base portion.

34. The semiconductor device component of claim 33, wherein said outer surface has a frustoconical configuration.

35. The semiconductor device component of claim 22, wherein said conductive center partially fills said aperture.

36. The semiconductor device component of claim 35, wherein said aperture is configured to receive at least an end of said second member.

37. The semiconductor device component of claim 35, wherein an upper portion of said aperture has a larger periphery than a base portion of said aperture.

38. The semiconductor device component of claim 36, wherein an internal ledge is disposed around at least a portion of a wall of said aperture between said upper portion and said base portion.

39. The semiconductor device component of claim 37, wherein said aperture tapers inwardly from said upper portion to said base portion.

40. The semiconductor device component of claim 22, wherein said conductive center comprises an at least partially unconsolidated conductive material.

41. The semiconductor device component of claim 40, wherein said at least partially unconsolidated conductive material is an at least partially uncured conductive resin.

42. The semiconductor device component of claim 41, wherein said at least partially uncured conductive resin is an uncured conductive resin.

43. The semiconductor device component of claim 22, wherein said conductive center comprises a thermoplastic conductive elastomer.

44. The semiconductor device component of claim 22, wherein said conductive center comprises a solder, a metal, or a metal alloy.

45. The semiconductor device component of claim 22, wherein said first member comprises a photopolymer.

46. The semiconductor device component of claim 45, wherein said first member comprises a plurality of superimposed, contiguous, mutually adhered layer of said photopolymer.

47. A semiconductor device assembly, comprising:

at least one semiconductor device having a surface with at least one contact pad exposed thereto;

a substrate having a surface with at least one at least one contact pad exposed thereto, said at least one contact pad located correspondingly to said at least one contact pad of said semiconductor device; and

a conductive structure secured to said at least one contact pad of said semiconductor device and to said at least one contact pad of said substrate, said conductive structure having:

a first member secured to one of said at least one semiconductor device and said substrate, said first member including a jacket having an aperture therethrough and a conductive center disposed in said aperture, said conductive center in communication with said at least one contact pad; and

a second member secured to another of said at least one semiconductor device and said substrate, said second member located correspondingly to said first member, said second member including a jacket having an aperture therethrough and a conductive center disposed in said aperture, said conductive center in communication with said at least one contact pad, said second member configured to be interconnected with said first member.

48. The semiconductor device assembly of claim 47, wherein one member of said first member and said second member has a receptacle configured to receive at least an end of the other member of said second member and said first member.

49. The semiconductor device assembly of claim 48, wherein said aperture of said one member has an upper portion with a smaller periphery than a base portion thereof.

50. The semiconductor device assembly of claim 49, wherein said aperture includes an inner ledge disposed between said upper portion and said base portion.

51. The semiconductor device assembly of claim 49, wherein at least a portion of a wall of said aperture tapers inwardly toward said base portion.

52. The semiconductor device assembly of claim 49, wherein said aperture is configured to limit a distance the other member is inserted into said receptacle.

53. The semiconductor device assembly of claim 48, wherein said jacket of the other member has an outer surface with a smaller periphery at said end that at a base portion thereof.

54. The semiconductor device assembly of claim 53, wherein said outer surface includes an outer ledge disposed between said end and said base portion.

55. The semiconductor device assembly of claim 53, wherein said outer surface tapers outwardly from said end to said base portion.

56. The semiconductor device assembly of claim 55, wherein said outer surface has a frustoconical configuration.

57. The semiconductor device assembly of claim 47, wherein said conductive center of at least one of said first and second members comprises an at least partially unconsolidated conductive material.

58. The semiconductor device assembly of claim 57, wherein said at least partially unconsolidated conductive material is an at least partially uncured conductive resin.

59. The semiconductor device assembly of claim 58, wherein said at least partially uncured conductive resin is an uncured conductive resin.

60. The semiconductor device assembly of claim 47, wherein said conductive center of at least one of said first and second members comprises a thermoplastic conductive elastomer.

61. The semiconductor device assembly of claim 47, wherein said conductive center of at least one of said first and second members comprises a solder, a metal, or a metal alloy.

62. The semiconductor device assembly of claim 47, wherein at least one member of said first and second members comprises a photopolymer.

63. The semiconductor device assembly of claim 62, wherein said at least one member comprises a plurality of superimposed, contiguous, mutually adhered layer of said photopolymer.

64. The semiconductor device assembly of claim 47, wherein said at least one semiconductor device comprises a flip-chip type semiconductor device.

65. The semiconductor device assembly of claim 64, wherein said flip-chip type semiconductor device is a flip-chip die.

66. The semiconductor device assembly of claim 64, wherein said flip-chip type semiconductor device is a ball grid array package.

67. The semiconductor device assembly of claim 47, wherein said at least one semiconductor device comprises a chip scale package.

68. The semiconductor device assembly of claim 47, wherein said substrate comprises a carrier substrate.

69. The semiconductor device assembly of claim 47, wherein said substrate comprises another semiconductor device.

70. A method of electrically connecting a contact pad of a semiconductor device with a contact pad of a substrate, comprising:

providing a semiconductor device having a first member of a conductive structure protruding from at least one contact pad thereof;

providing a substrate having a second member of said conductive structure protruding from at least one contact pad thereof;

orienting the semiconductor device face-down relative to the substrate with said first member and said second member in at least rough alignment; and

interconnecting said first member and said second member.

71. The method of claim 70, wherein said interconnecting comprises inserting at least an end of said first member into a receptacle of said second member.

72. The method of claim 70, wherein said interconnecting comprises inserting at least an end of said second member into a receptacle of said first member.

73. The method of claim 70, wherein said interconnecting comprises establishing an electrical connection between the contact pad of the semiconductor device and the corresponding contact pad of the substrate.

74. The method of claim 70, further comprising integrating a conductive center of said first member with an conductive center of said second member.

75. The method of claim 74, wherein said integrating comprises polymerizing a material of at least one of said conductive centers following said interconnecting.

76. The method of claim 75, wherein said polymerizing comprises heating said material.

77. The method of claim 74, wherein said integrating comprises wetting at least one of said conductive centers.

78. The method of claim 74, wherein said integrating comprises at least partially melting at least one of said conductive centers.

79. The method of claim 78, further comprising solidifying at least one of said conductive centers.

80. The method of claim 70, wherein said interconnecting comprises partially interconnecting said first member and said second member.

81. A method for fabricating a conductive structure having two interconnectable members, comprising:

providing at least one substrate having at least one contact pad exposed at a surface thereof; and

disposing at least a first member of a conductive structure over said at least one contact pad, said first member having a conductive center and a jacket configured to laterally contain material of said conductive center therein over said at least one contact pad, said first member being configured to connect with a complementary second member of said conductive structure.

82. The method of claim 81, wherein said disposing at least said first member comprises securing said jacket to said at least one substrate with at least a portion of said at least one contact pad being exposed therethrough.

83. The method of claim 82, further comprising disposing said conductive center in communication with said at least one contact pad following said securing said jacket.

84. The method of claim 83, wherein said disposing said conductive center comprises disposing at least partially unconsolidated conductive material in communication with said at least one contact pad.

85. The method of claim 84, wherein said disposing at least partially unconsolidated conductive material comprises disposing at least partially uncured conductive resin in communication with said at least one contact pad.

86. The method of claim 85, wherein said disposing at least partially unconsolidated conductive material comprises disposing uncured conductive resin in communication with said at least one contact pad.

87. The method of claim 84, wherein said disposing at least partially unconsolidated conductive material comprises disposing solder paste in communication with said at least one contact pad.

88. The method of claim 84, wherein said disposing at least partially unconsolidated conductive material comprises disposing a molten solder, metal, or metal alloy in communication with said at least one contact pad.

89. The method of claim 84, wherein said disposing at least partially unconsolidated conductive material comprises disposing an at least partially melted conductive elastomer in communication with said at least one contact pad.

90. The method of claim 83, wherein said disposing said conductive center comprises disposing a preformed conductive center in communication with said at least one contact pad.

91. The method of claim 81, wherein said disposing at least said first member comprises positioning said jacket around a conductive center secured to said at least one contact pad.

92. The method of claim 81, wherein said disposing at least said first member comprises fabricating said jacket on said surface.

93. The method of claim 92, wherein said fabricating comprises fabricating said jacket from a photopolymer.

94. The method of claim 93, wherein said fabricating comprises fabricating said jacket as at least two superimposed, contiguous, mutually adhered layers.

95. The method of claim 81, wherein said providing comprises providing at least one semiconductor device.

96. The method of claim 95, wherein said providing comprises providing a plurality of semiconductor devices.

97. The method of claim 96, wherein said providing comprises providing at least one semiconductor wafer with a plurality of semiconductor dice.

98. The method of claim 95, wherein said providing comprises providing at least one flip-chip type semiconductor device.

99. The method of claim 98, wherein said providing comprises providing at least one flip-chip die.

100. The method of claim 98, wherein said providing comprises providing at least one ball grid array package.

101. The method of claim 95, wherein said providing comprises providing at least one chip scale package.

102. The method of claim 81, wherein said providing comprises providing at least one carrier substrate.

103. The method of claim 81, wherein said disposing comprises securing said jacket to said surface.

104. The method of claim 103, further comprising, prior to said disposing, fabricating said jacket to have at least two superimposed, contiguous, mutually adhered layers.

105. The method of claim 104, wherein said fabricating comprises fabricating at least one of said layers from a photopolymer material.

106. A method of fabricating a semiconductor device component, comprising:

providing at least one substrate with at least one contact pad exposed at a surface thereof; and

sequentially forming at least one layer of at least one jacket of a first member of a conductive structure on said surface around said at least one contact pad, said at least one jacket having an aperture formed through the length thereof and configured to laterally contain conductive material over said at least one contact pad, said at least one jacket configured to interconnect with a jacket of a second member of said conductive structure.

107. The method of claim 106, wherein said sequentially forming comprises forming said at least one layer from a photopolymer.

108. The method of claim 106, wherein said providing at least one substrate comprises providing at least one semiconductor device.

109. The method of claim 108, wherein said providing at least one semiconductor device comprises providing at least one wafer including a plurality of semiconductor dice.

110. The method of claim 108, wherein said providing at least one semiconductor device comprises providing a flip-chip type semiconductor device.

111. The method of claim 110, wherein said providing said flip-chip type semiconductor device comprises providing a flip-chip die.

112. The method of claim 110, wherein said providing said flip-chip type semiconductor device comprises providing a ball grid array package.

113. The method of claim 108, wherein said providing at least one semiconductor device comprises providing a chip scale package.

114. The method of claim 106, wherein said providing at least one substrate comprises providing at least one carrier substrate.

115. The method of claim 106, wherein said sequentially forming comprises forming said aperture to have a larger periphery at an upper portion thereof than at a base portion thereof.

116. The method of claim 115, wherein said forming comprises forming an inner ledge between said upper portion and said base portion.

117. The method of claim 115, wherein said forming comprises forming at least a portion of a wall of said aperture to taper inwardly from said upper portion to said base portion.

118. The method of claim 106, wherein said sequentially forming comprises forming said at least one jacket to have an outer surface with a smaller periphery at an end thereof than at a base portion thereof.

119. The method of claim 118, wherein said forming comprises forming an outer ledge on said outer surface between said end and said base portion.

120. The method of claim 118, wherein said forming comprises forming at least a portion of said outer surface to taper outwardly from said end to said base portion.

121. The method of claim 120, wherein said forming comprises forming said at least one jacket to have a frustoconical configuration.

122. The method of claim 106, further comprising disposing conductive material in said aperture.

123. The method of claim 122, wherein said disposing comprises substantially filling said aperture with said conductive material.

124. The method of claim 122, wherein said disposing comprises partially filling said aperture with said conductive material.

125. The method of claim 124, wherein said sequentially forming comprises forming said aperture to receive at least an end of said second member.

126. The method of claim 122, wherein said disposing comprises disposing at least partially unconsolidated conductive material in said aperture.

127. The method of claim 126, wherein said disposing comprises disposing at least partially uncured conductive resin in said aperture.

128. The method of claim 127, wherein said disposing comprises disposing uncured conductive resin in said aperture.

129. The method of claim 126, wherein said disposing at least partially unconsolidated conductive material comprises disposing solder paste in said aperture.

130. The method of claim 126, wherein said disposing at least partially unconsolidated conductive material comprises disposing a molten solder, metal, or metal alloy in said aperture.

131. The method of claim 126, wherein said disposing at least partially unconsolidated conductive material comprises disposing an at least partially melted conductive elastomer in said aperture.

132. The method of claim 106, further comprising securing a preformed conductive center to said at least one contact pad.

133. The method of claim 132, wherein said securing said preformed conductive center is effected before said sequentially forming.

134. The method of claim 132, wherein said securing said preformed conductive center is effected after said sequentially forming.

135. A method of fabricating a semiconductor device component, comprising:

placing at least one substrate with contact pads in a horizontal plane;

recognizing a location and orientation of said at least one substrate; and

stereolithographically fabricating at least one jacket of a first member of a conductive structure, said first member comprising at least one layer of at least semisolid material on a surface of said substrate, said at least one jacket around at least one contact pad of said contact pads, said at least one jacket protruding from said surface so as to laterally contain conductive material of a conductive center of said first member over at least a portion of said at least one contact pad, said first member being configured to connect with a complementarily configured second member of said conductive structure.

136. The method of claim 135, further comprising storing data including at least one physical parameter of said at least one substrate and of said at least one jacket in computer memory, and using the stored data in conjunction with a machine vision system to recognize the location and orientation of said at least one substrate.

137. The method of claim 136, further including in computer memory at least one physical parameter of said at least one contact pad around which said at least one jacket is to be fabricated.

138. The method of claim 136, further including in computer memory at least one parameter of another substrate component with which said at least one substrate is to be assembled.

139. The method of claim 136, further comprising using the stored data, in conjunction with said machine vision system, to effect said stereolithographically fabricating at least one layer of said at least one jacket.

140. The method of claim 135, further comprising recognizing a location of said at least one contact pad.

141. The method of claim 135, further including securing said at least one substrate to a carrier prior to placing said at least one substrate in said horizontal plane.